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REMARKS

The Applicants request reconsideration of the final rejection mailed October 21, 2005.

Claims 1-16 and 18-25 are now pending.

In the final rejection, Claims 1-5, 9, 15, 18, and 24 were rejected under 35 U.S.C. 102(b) as being anticipated by Clifton et al., U.S. 4,310,883 (Clifton). Claims 6-7, 10-14, 16, 22, and 25 were rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton in view of Prahlad et al., U.S. 2004/0250033 (Prahlad). Claims 8, 19, and 20 were rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton in view of Kusters et al., U.S. 6,681,310 (Kusters). Claim 23 was rejected under 35 U.S.C. 103(a) as being unpatentable over Clifton in view of Kusters and Prahlad.

The Applicants respectfully traverse each of these rejections at least on the grounds that Clifton does not sufficiently disclose features of the invention, even if combined with one or more of Prahlad and Kusters, such that the claimed invention would be rendered unpatentable.

For example, Clifton is seen to disclose staging and destaging features that do not correspond to the fibre channel transfer required for each of the amended claims. In addition, whereas Clifton has a focus on speed and total

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capacity of a tape library, as a low-performance backup

storage Clifton does not employ a virtual volume in any

respect, or subtract a virtual volume from a total effective

capacity, as required by the amended claims. Moreover,

whereas both the tape library and direct access storage

devices (DASDs) of Clifton are known to the host computer, the

virtual volume is transparent to the host computer in the

present invention. That is, the host computer does not know

that it is accessing a volume in the claimed one or more

second-level storage devices, but rather accesses a virtual

volume with the "knowledge" that the virtual volume is part of

the first-level storage device or devices.

Thus, Clifton does not teach or fairly suggest a computer

system having one or more first-level storage units each

containing one or more first volumes, each of the first

volumes being a target volume of an access sent from the

computer via a fibre channel interface, and the one or more

first volumes having at least one virtual volume; a plurality

of second-level storage units, each of which is connected

through a fibre channel network to and hierarchically linked

to, one of the first-level storage units, the second-level

storage units containing one or more second volumes, wherein

each of the second volumes can be a target volume of an access

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sent from the computer via a fibre channel interface; wherein the one or more first-level storage units are arranged to receive data access requests from the computer to the virtual volume, and to relay the data access requests to at least one of the second volumes based on a relationship between the virtual volume and the at least one second volume that corresponds to the virtual volume, such that the virtual volume as accessed by the computer is transparent as to its relationship to the at least one second volume; and effective capacity calculating means for calculating the total effective capacity of the volumes of the first-level and second-level storage units based on subtracting the capacity of the virtual volume from the total capacity of the first and second volumes by using volume information and virtualization information collected by volume information collecting means and virtualization information collecting means, respectively.

The above discussion pertains directly to the language of amended Claim 1. However, the Applicants note that independent Claim 9 recites a management computer including volume information collecting means for collecting volume information on the total capacity of first volumes from one or more first-level storage units containing the first volumes, wherein each of the first volumes is a target volume of an

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access sent from a computer via a fibre channel interface, and

the one or more first volumes having at least one virtual

volume. The volume information collecting means also collects

volume information on the total capacity of second volumes

from one or more second-level storage units, each of which is

connected through a fibre channel network to, and

hierarchically linked to, one of the first-level storage

units, the one or more second-level storage units containing

at least one second volume, wherein each of the second volumes

can be a target volume of an access sent from the computer via

a fibre channel interface. Claim 9 also requires that the at

least one virtual volume as accessed by the computer be

transparent as to its relationship to the at least one second

volume, and that effective capacity calculating means

calculate the total effective capacity of the volumes of the

first-level and second-level storage units based on

subtracting the capacity of the virtual volume from the total

capacity of the first and second volumes by using the volume

information and virtualization information on the

relationships between the virtual volume and the at least one

second volume.

Independent Claim 15 is directed to a management method

for managing capacities of volumes storing data used by a

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computer, the management method using a management computer
and comprising steps of providing one or more first volumes in
a first storage unit, each of the first volumes being a target
volume of an access sent from the computer via a fibre channel
interface, the one or more first volumes having at least one
virtual volume; establishing a hierarchical relationship
between the first storage unit and a second storage unit that
allows one or more second volumes in the second storage unit
to be a target volume of an access sent from the computer via
a fibre channel interface, wherein the second storage unit is
connected through a fibre channel network to, and
hierarchically linked to, the first storage unit; and
calculating the total effective capacity of the volumes of the
first and second storage units based on subtracting the
capacity of the virtual volume from the total capacity of the
first and second volumes by using volume information and
virtualization information collected according to the method.

Independent Claim 18 is directed to a storage medium on
which is stored a program designed to run on a management
computer, the program causing the management computer to
perform a method comprising steps of collecting from a first
storage unit, volume information on the total capacity of
first volumes contained therein, collecting from a second

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storage unit, volume information on the total capacity of

second volumes contained therein; wherein the second storage

unit is connected through a fibre channel network to, and

hierarchically linked to, the first storage unit, and wherein

the hierarchical relationship allows one or more second

volumes in the second storage unit to be a target volume of an

access sent from the computer via a fibre channel interface;

and calculating the total effective capacity of the volumes of

the first and second storage units based on subtracting the

capacity of the virtual volume from the total capacity of the

first and second volumes by using volume information and

virtualization information collected according to the method,

wherein the first storage unit is arranged to receive data

access requests from the computer to the virtual volume, and

to relay the data access requests to at least one of the

second volumes based on a relationship between the virtual

volume and the at least one second volume that corresponds to

the virtual volume, such that the virtual volume as accessed

by the computer is transparent as to its relationship to the

at least one second volume.

Independent Claim 23 is directed to a computer system

including one or more first-level storage units each

containing one or more first volumes, a plurality of second-

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level storage units each of which is connected through a fibre

channel network to, and hierarchically linked to, one of the

first-level storage units, the second-level storage units

containing one or more second volumes, and a management

computer for managing the status of the volumes contained in

the first-level and second-level storage units. More

particularly, Claim 23 is directed to a management method for

managing the volumes in the first-level and second-level

storage units comprising steps of providing one or more first

volumes in the one or more first-level storage units, each of

the first volumes being a target volume of an access sent from

the computer via a fibre channel interface, and the one or

more first volumes having at least one virtual volume;

establishing a hierarchical relationship between one of the

first-level storage units and one of the second-level storage

units that allows one or more second volumes in the one of the

second-level storage units to be a target volume of an access

sent from the computer via a fibre channel interface, wherein

the one of the second-level storage units is connected through

a fibre channel network to, and hierarchically linked to, one

of the first-level storage units, wherein one of the first-

level storage units is arranged to receive data access

requests from the computer to the virtual volume, and to relay

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the data access requests to at least one of the second volumes
based on a relationship between the virtual volume and the at
least one second volume that corresponds to the virtual
volume, such that the virtual volume as accessed by the
computer is transparent as to its relationship one second
volume; and displaying the contents of a consolidated
information table in at least three display sections of a
display, including a third display section for displaying the
total available capacity of the first-level and second-level
storage units based on subtracting the capacity of the virtual
volume from the total capacity of the first and second volumes
by using volume information and virtualization information
respecting the volumes and storage units.

Independent Claim 24 recites a management computer for
managing the status of storage units for containing volumes
for storing data used by a computer, comprising a CPU and a
fibre channel interface connected by a management unit,
wherein the CPU collects volume information on the volumes
from one or more first-level storage units containing first
volumes, and from one or more second-level storage units, each
of which is connected through a fibre channel network to, and
hierarchically linked to, one of the first-level storage
units. Each of the first volumes is a target volume of an

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access sent from the computer via a fibre channel interface,

and the one or more first volumes has at least one virtual

volume. The one or more second-level storage units contain at

least one second volume, and each of the second volumes can be

a target volume of an access sent from the computer via a

fibre channel interface. The one or more first-level storage

units are arranged to receive data access requests from the

computer to the virtual volume, and to relay the data access

requests to at least one of the second volumes based on a

relationship between the virtual volume and the at least one

second volume that corresponds to the virtual volume, such

that the virtual volume as accessed by the computer is

transparent as to its relationship to the at least one second

volume. Further, the CPU calculates the total effective

capacity of the volumes of the first-level and the second-

level storage units based on subtracting the capacity of the

virtual volume from the total capacity of the first and second

volumes by using volume information and virtualization

information collected by the CPU.

The above summaries of the independent claims highlights

some of the patentably-distinctive limitations that are found

in the independent claims, but the summaries are not intended

to recite exhaustively the only patentable features of the

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claims. The Applicants note that other patentably-distinctive features are present in the claims, and that the combination of limitations of each independent claim lends patentability as well. Further, the dependent claims are considered to have separate patentability over the prior art, whether taken individually or in any motivated combination.

Claim 1 was provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over Claim 1 of co-pending Application No. 10/811,868. Claim 9 was provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable of Claim 8 of Application '868. The Applicants respectfully traverse the double patenting rejections, noting the substantial amendments made to these Claims 1 and 9, but also noting that the co-pending application claims underlying the provisional rejections contain no recitation of the claimed feature of calculating total effective capacity based on a subtraction as set forth in the claims, wherein the capacity of the virtual volume is subtracted from the total capacity of the first and second volumes so as to reveal the effective capacity of the hierarchical storage subsystem.

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    In view of the foregoing amendments and remarks, the

Applicants request reconsideration of the rejection and

allowance of the claims.

Respectfully submitted,

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